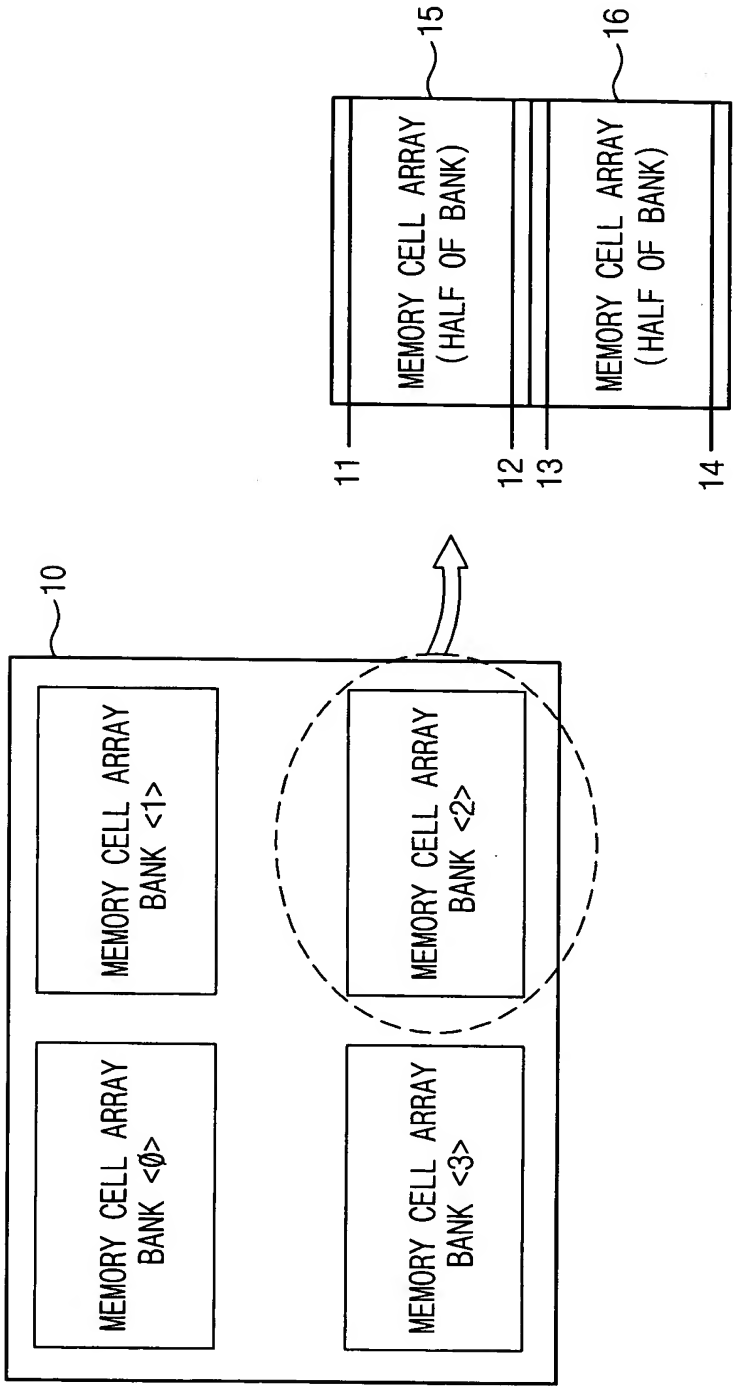


Fig.1
(Prior Art)

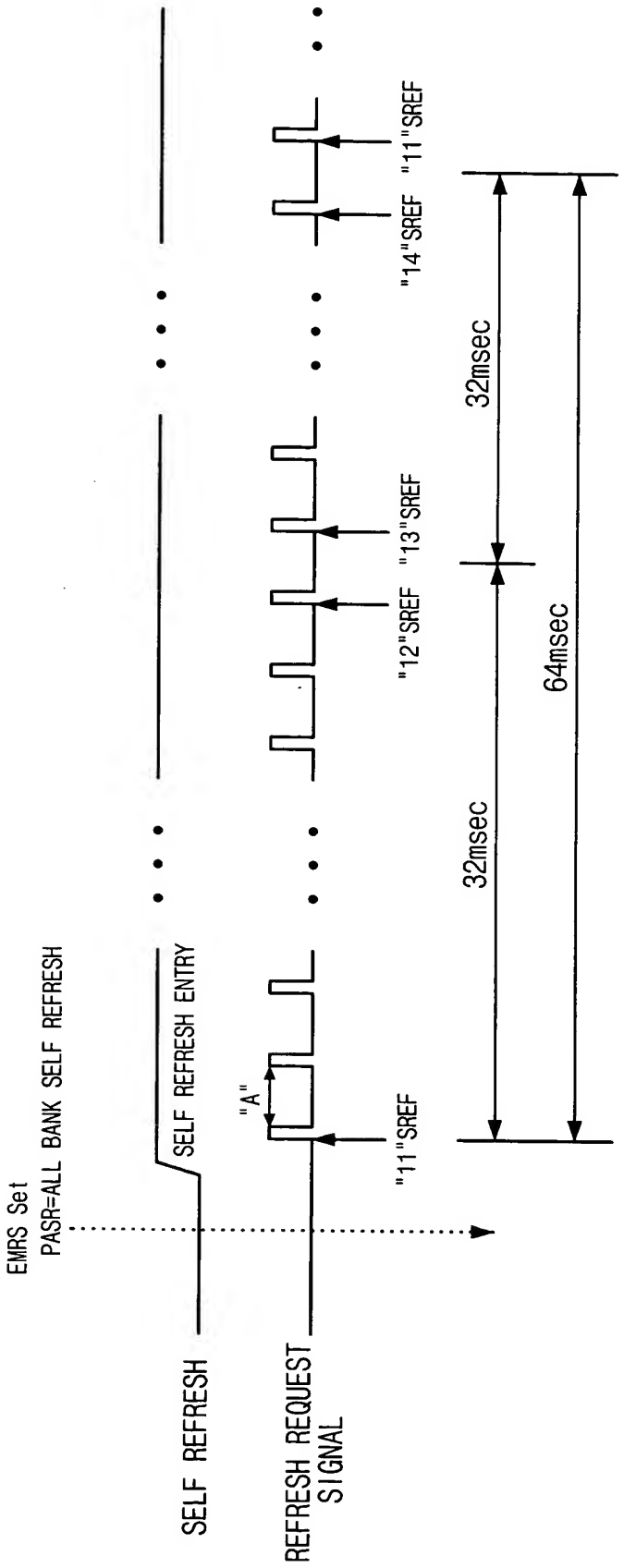


Fig.2
(Prior Art)

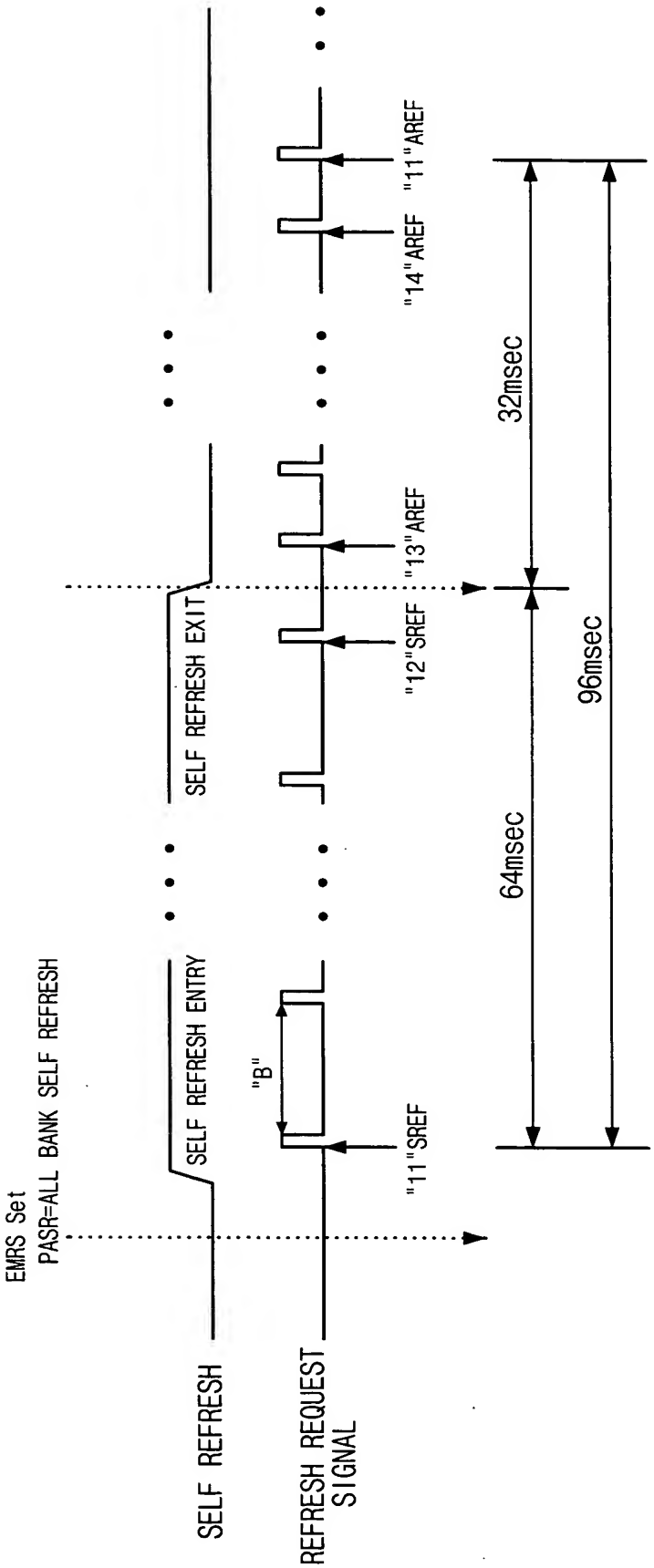
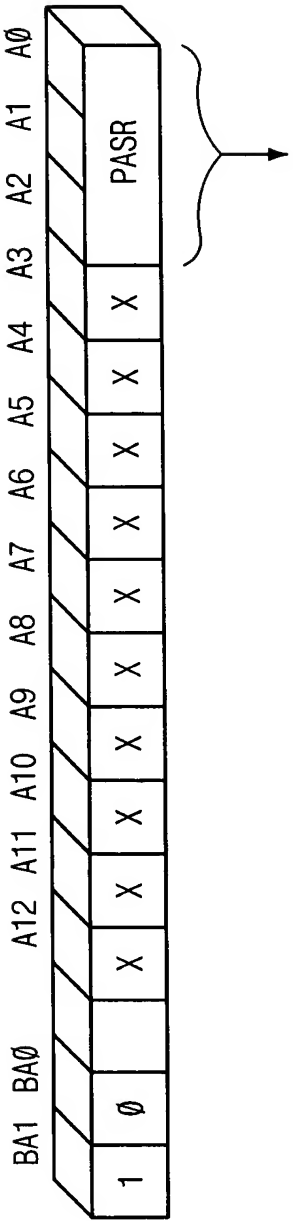


Fig.3
(Prior Art)



A2	A1	A0	SELF REFRESH APPLY
0	0	0	ALL BANK
0	0	1	HALF ARRAY(BA1=0)
0	1	0	QUATER ARRAY(BA1=BA0=0)
0	1	1	RFU
1	0	0	RFU
1	0	1	HALF OF BANK(BA1=BA0=ROW ADDRESS MSB=0)
1	1	0	QUATER OF BANK(BA1=BA0=ROW ADDRESS 2 MSB=0)
1	1	1	RFU

Fig.4

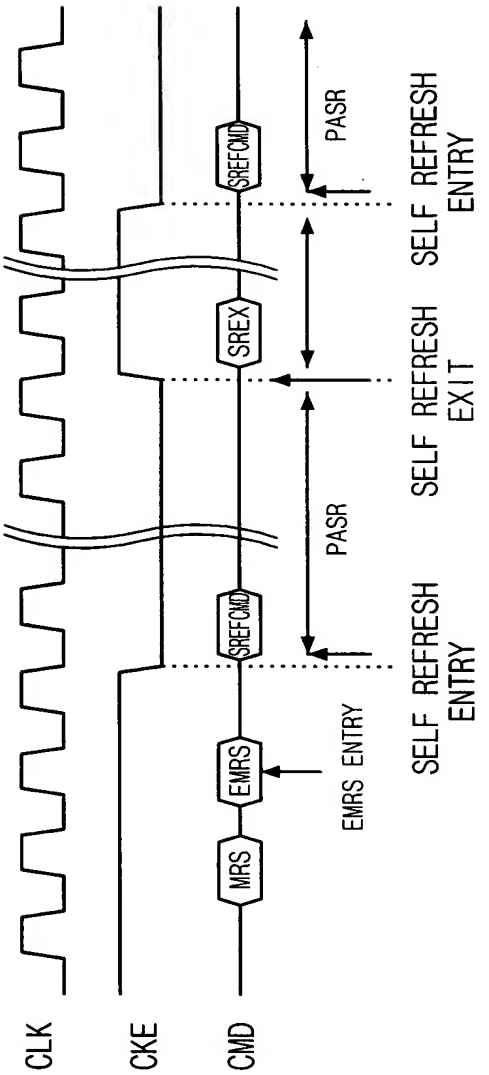

CLK
CKE
CMD
MRS
EMRS
SREFCMD
SREX
SREFCMD
EMRS ENTRY
SELF REFRESH ENTRY
PASR
SELF REFRESH EXIT
PASR
SELF REFRESH ENTRY

Fig.5

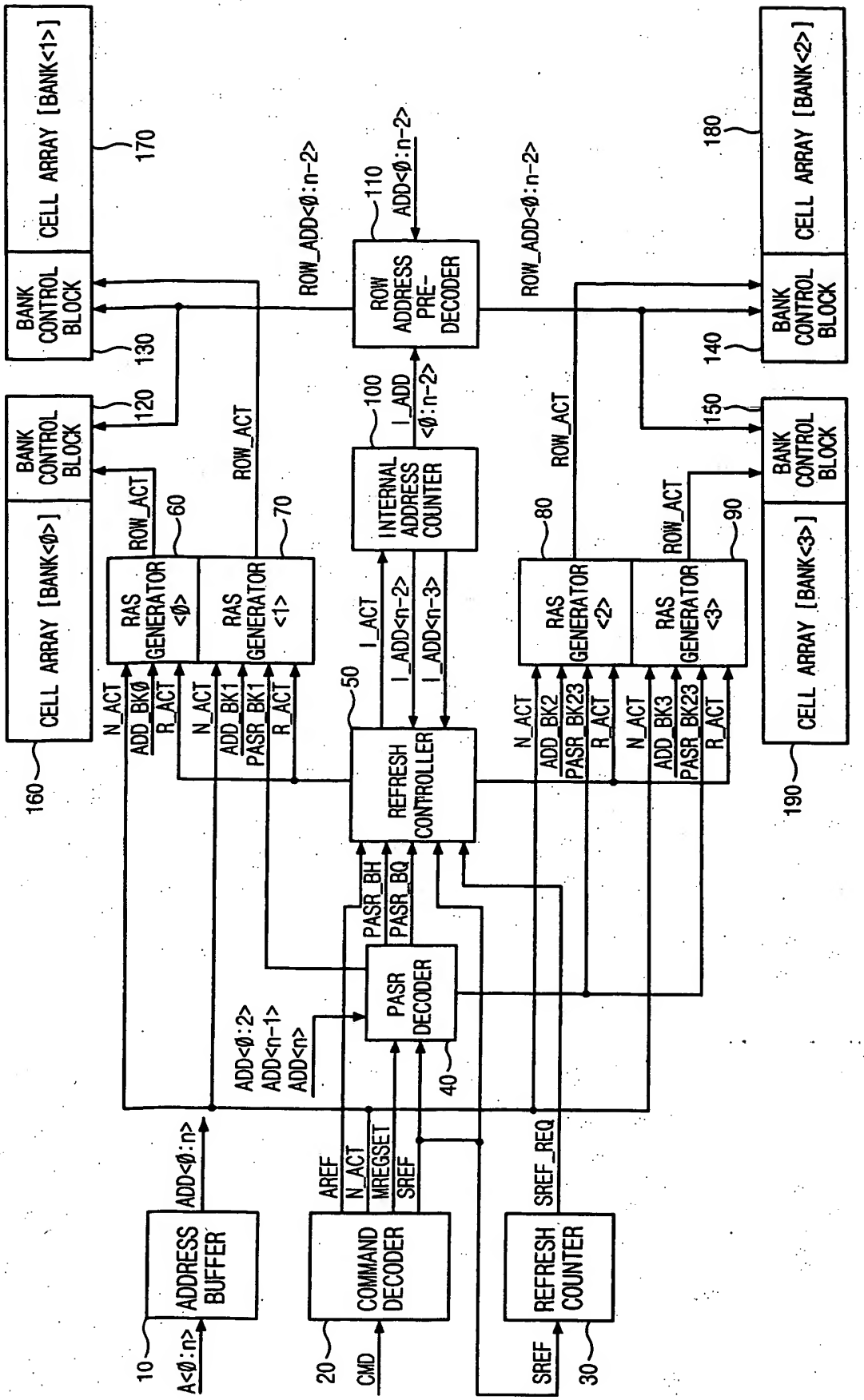

CELL ARRAY [BANK<1>]
170
BANK CONTROL BLOCK
130
ROW_ADD<Ø:n-2>
ROW ADDRESS PRE-DECODER
110
ADD<Ø:n-2>
CELL ARRAY [BANK<2>]
180
BANK CONTROL BLOCK
140
BANK CONTROL BLOCK
120
ROW_ACT
100
I_ADD <Ø:n-2>
INTERNAL ADDRESS COUNTER
BANK CONTROL BLOCK
150
CELL ARRAY [BANK<Ø>]
160
ROW_ACT
60
ROW_ACT
70
ROW_ACT
80
ROW_ACT
90
RAS GENERATOR <Ø>
RAS GENERATOR <1>
RAS GENERATOR <2>
RAS GENERATOR <3>
CELL ARRAY [BANK<3>]
190
I_ACT
I_ADD<n-2>
I_ADD<n-3>
50
N_ACT
ADD_BKØ
R_ACT
N_ACT
ADD_BK1
PASR_BK1
R_ACT
N_ACT
ADD_BK2
PASR_BK23
R_ACT
N_ACT
ADD_BK3
PASR_BK23
R_ACT
REFRESH CONTROLLER
PASR_BH
PASR_BQ
PASR DECODER
40
ADD<Ø:2>
ADD<n-1>
ADD<n>
ADD<Ø:n>
AREF
N_ACT
MRESET
SREF
SREF_REQ
ADDRESS BUFFER
COMMAND DECODER
REFRESH COUNTER
10
A<Ø:n>
20
CMD
SREF
30

Fig.6

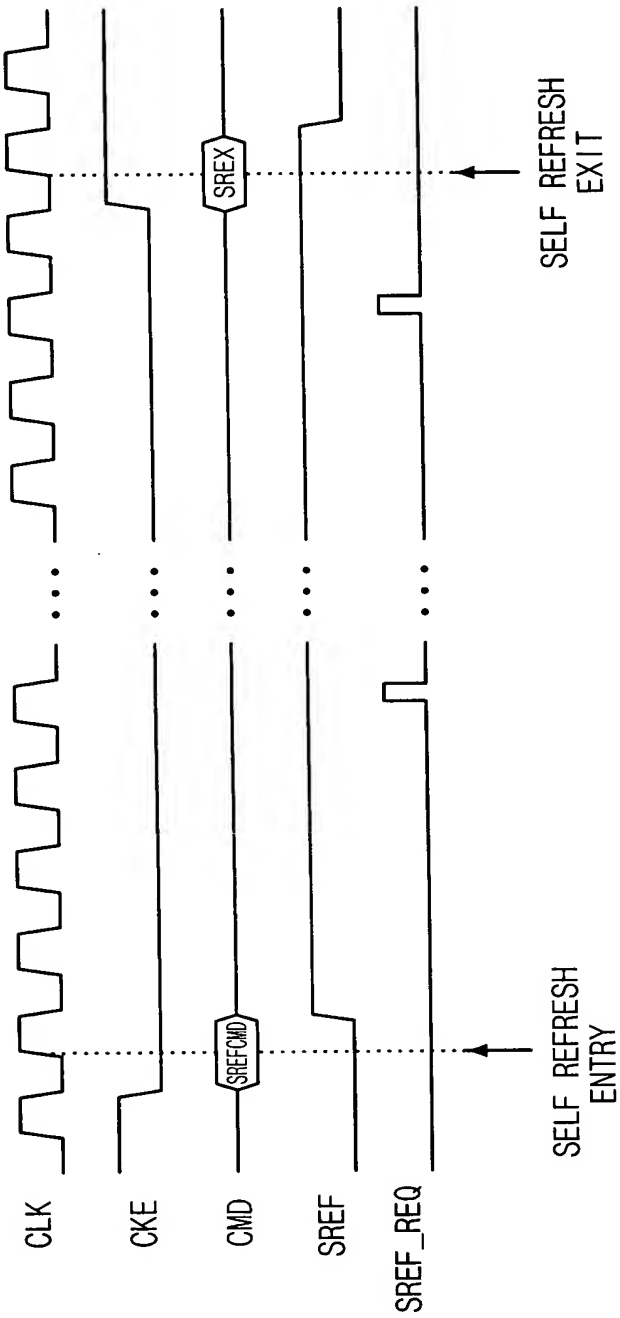

CLK
CKE
CMD
SREF
SREF_REQ
SREFCMD
SREX
SELF REFRESH ENTRY
SELF REFRESH EXIT

Fig.7

Tae Yun KIM
"Self-Refresh Apparatus and Method"
Attorney Docket No. 40296-0042

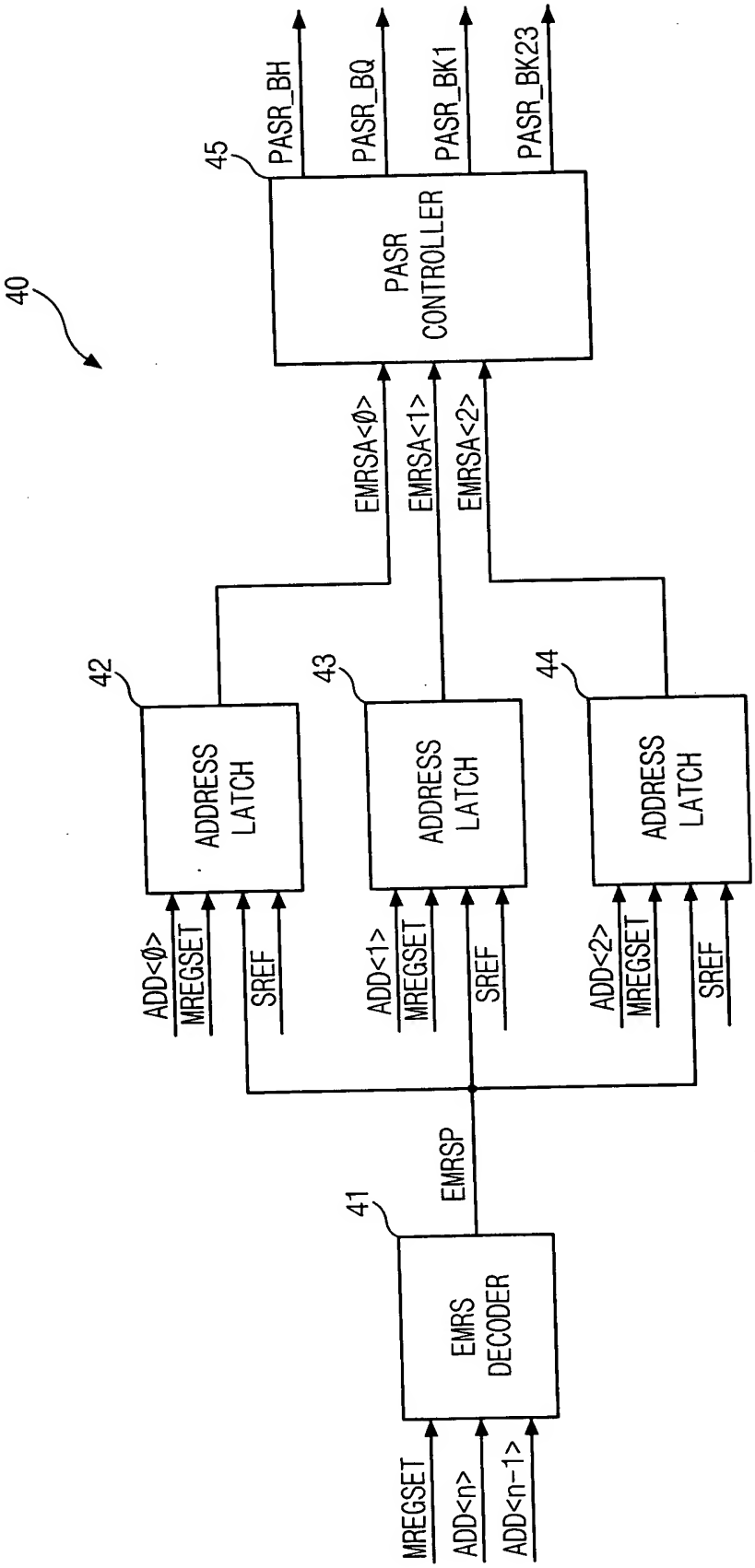


Fig.8

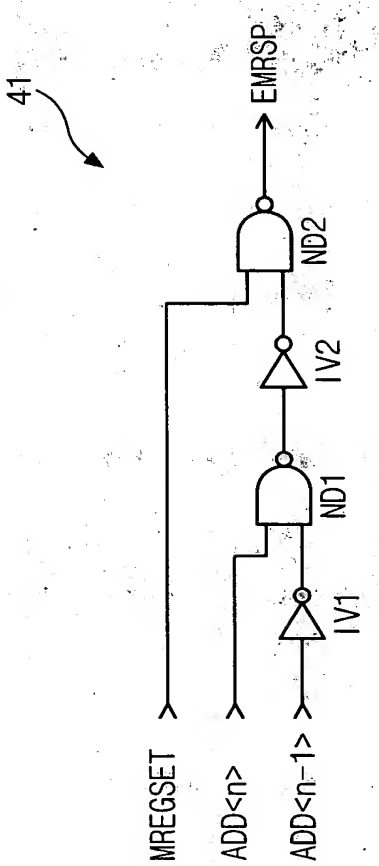


Fig.9

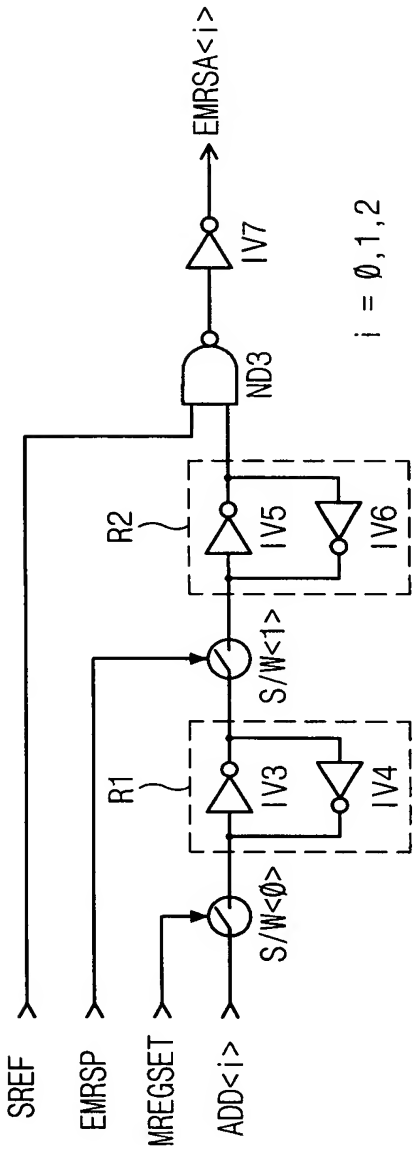

EMRSA<i>
IV7
ND3
i = Ø,1,2
R2
IV5
IV6
S/W<1>
R1
IV3
IV4
S/W<Ø>
SREF
EMRSP
MREGSET
ADD<i>

Fig.10

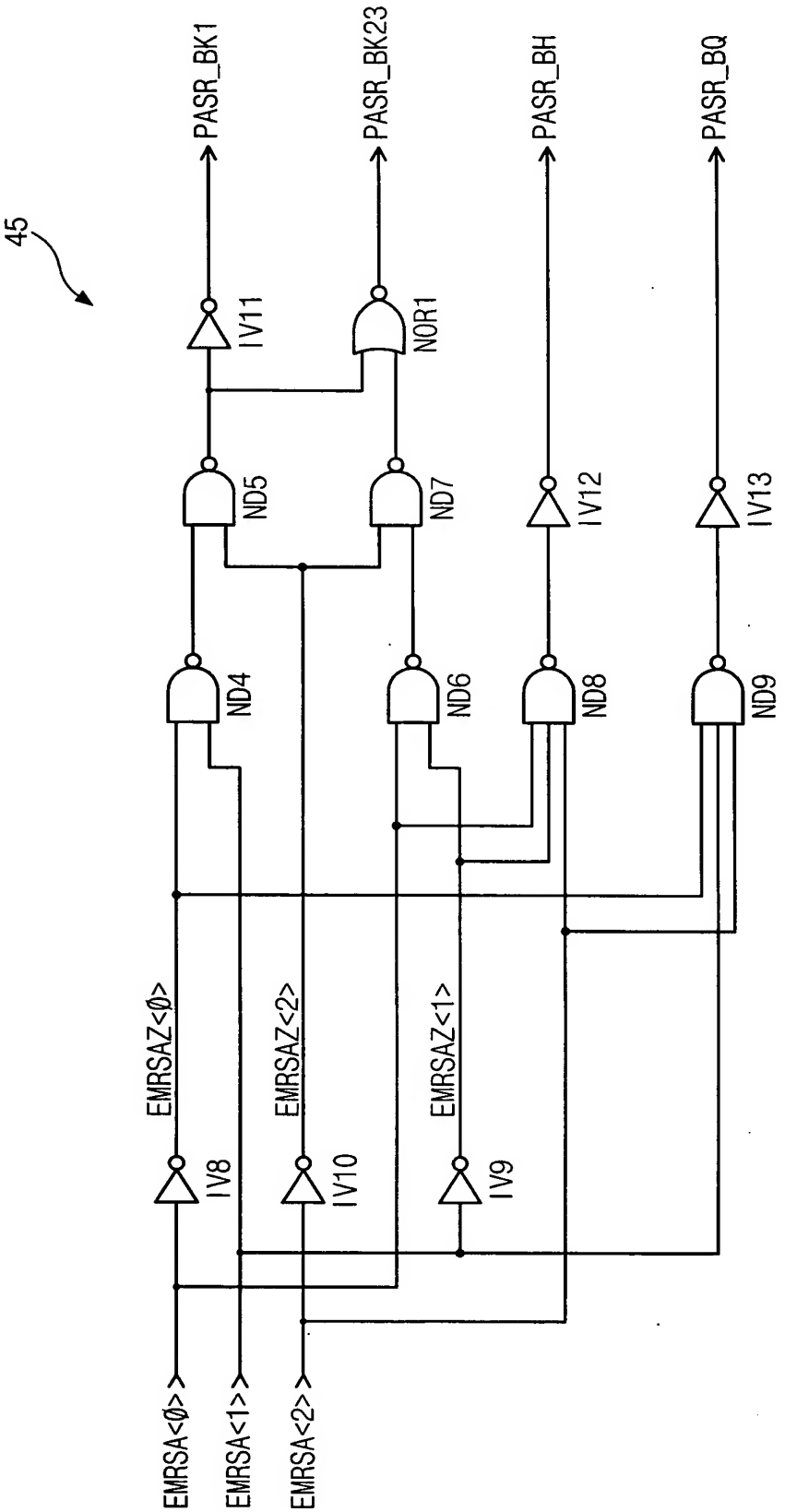

45
PASR_BK1
PASR_BK23
PASR_BH
PASR_BQ
IV11
NOR1
ND5
ND7
IV12
IV13
ND4
ND6
ND8
ND9
EMRSAZ<0>
EMRSAZ<2>
EMRSAZ<1>
IV8
IV10
IV9
EMRSA<0>
EMRSA<1>
EMRSA<2>

Fig.11

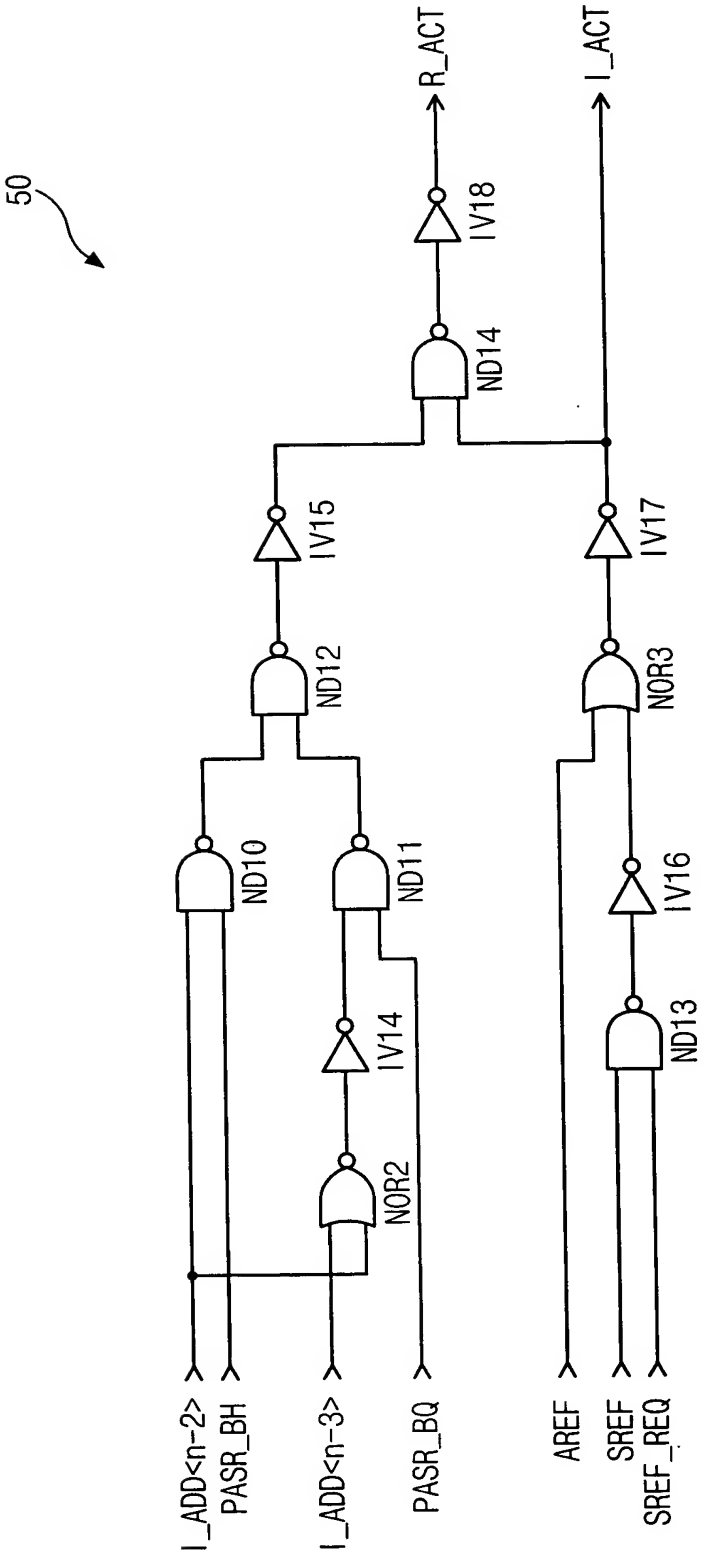

50
R_ACT
I_ACT
IV18
ND14
IV15
IV17
ND12
NOR3
ND10
ND11
IV16
IV14
ND13
NOR2
I_ADD<n-2>
PASR_BH
I_ADD<n-3>
PASR_BQ
AREF
SREF
SREF_REQ

Fig.12

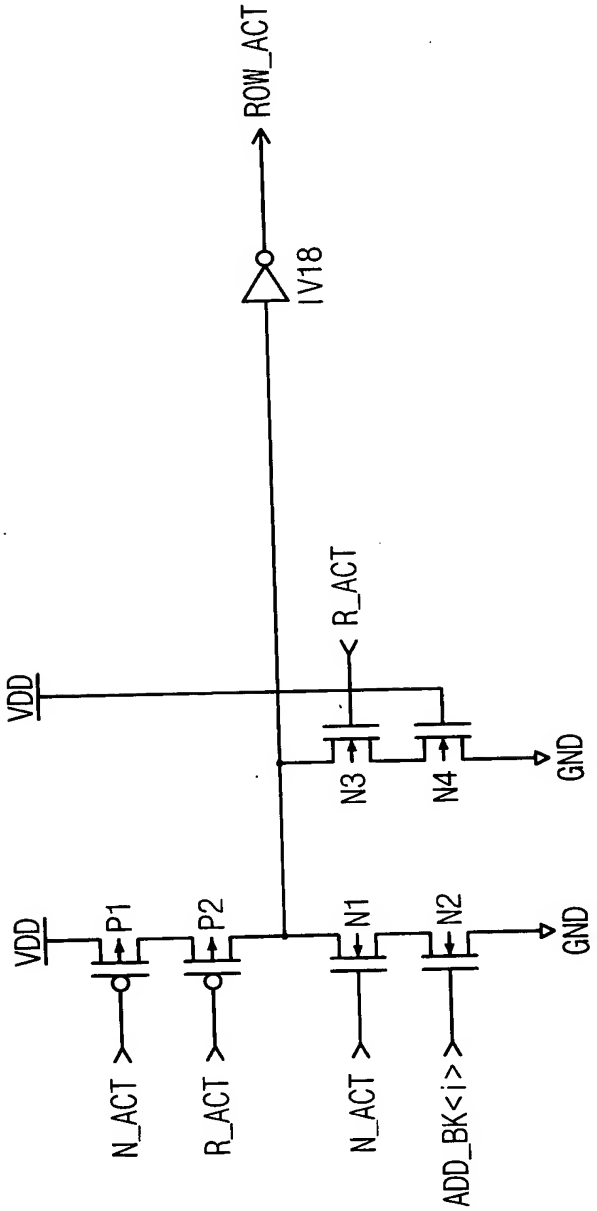

ROW_ACT
IV18
R_ACT
VDD
N3
N4
GND
VDD
P1
P2
N1
N2
GND
N_ACT
R_ACT
N_ACT
ADD_BK<i>

Fig.13

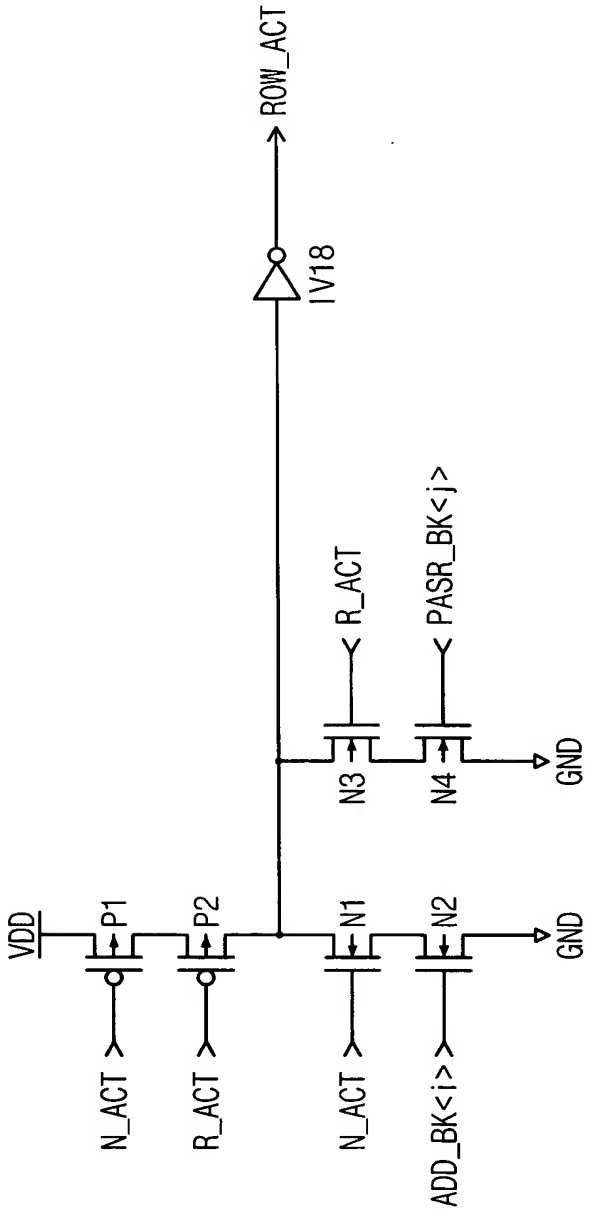

ROW_ACT
IV18
R_ACT
PASR_BK<j>
N3
N4
GND
VDD
P1
P2
N1
N2
GND
N_ACT
R_ACT
N_ACT
ADD_BK<i>

Fig.14

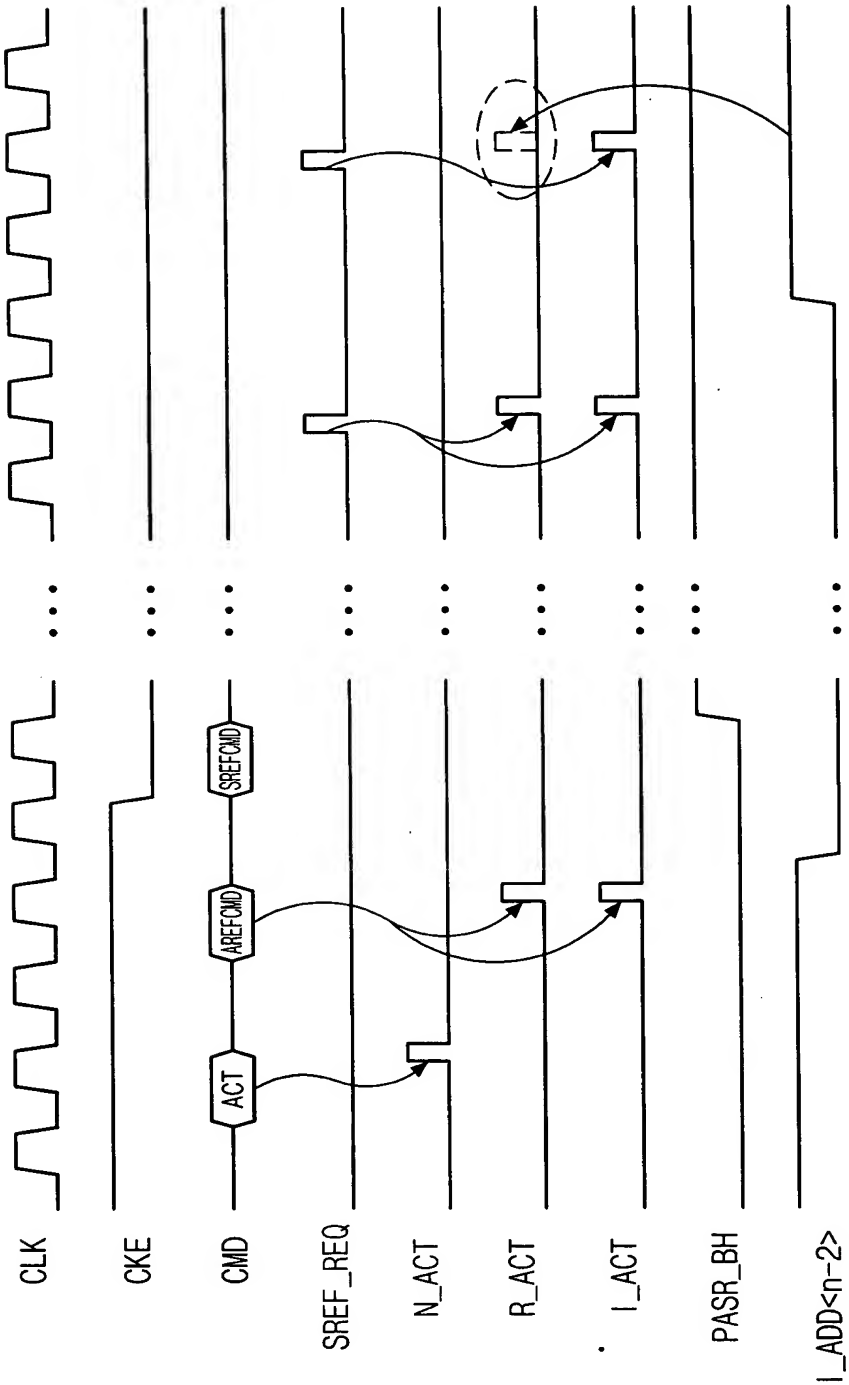

CLK
CKE
CMD
SREF_REQ
N_ACT
R_ACT
I_ACT
PASR_BH
I_ADD<n-2>
SREFCMD
AREFCMD
ACT

Fig.15